

elements
of
RADIATHERMY

a
primer
of
short wave therapy

courtesy of
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Los Angeles, Calif.

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preface

To the novice the contemplation of Short Wave Therapy may present a composite of the combined mysteries of electricity, radio, and perhaps even a little of occult magic, and the topic may be approached with a personal conviction that it is incomprehensible to other than the physicist and the engineer.

To the initiate, Radiathermy has been resolved simply into a new form of thermal therapy governed by all of the rules attending any other form of therapeutic heat. Thus, Short Wave Therapy becomes, largely, a mere mechanical problem, in which the several ingenuous methods for applying the energy are the contributing factors.

So with a brief review of the effects of therapeutic heat on the living body, this brochure treats only of the technics of application and pertaining data, without delving into the complexities of electrical physics and similar related studies.

In no sense a text on the subject, "The Elements of Radiathermy" is contributed to the existing literature solely to acquaint the beginner with the various prevailing technics and to clarify some of the confusion attending the terminology of this modern therapeutic measure.

"THE CYCLE OF INFLAMMATION"

Indicative of the proper classification of heat in the therapeutic armamentarium is the order by which the "Cycle of Inflammation" develops in those pathologic entities wherein it is induced. The familiar "Calor," "Rubor," "Tumor," "Dolor," of student days contains the creed of Short Wave Therapy in that the local, or general, temperature elevation ("Calor") induced by increased oxidation is the inciting force whereby the "cycle" is instituted.

Likewise it may be recalled that the "Cycle of Inflammation" is installed in the presence of both trauma and infection, the traumatic pathology invoking the process for absorptive and curative purposes and the infectious pathology for stimulation and acceleration of normal leukocytic function.

Manifestly a temperature elevation, artificially induced through conversion of electrical energies far in excess of that attainable by abnormal oxidation, tends to accelerate the "cycle" both qualitatively and quantitatively.

With this elementary preamble the indication for Short Wave Therapy is resolved into the simple rule "wherever normal curative function establishes the Cycle of Inflammation, Short Wave Therapy will accelerate the result." However, as in many other therapeutic methods, attending complications may preclude its use.

Few physicians would resort to a thermo-therapy of any nature in the presence of infection with inadequate drainage. Neither is Short Wave Therapy indicated in such conditions, i. e., appendicitis, etc. Likewise, hemorrhagic areas present a contra-indication and the Physician is safely guided who will depend upon his fundamental training as a reference to the conservative administration of Short Wave Therapy.

The field for brilliant results with Radiathermy is far too vast to embark upon a program of radical clinical experiment in the borderline conditions, although astonishing effects are being demonstrated in some cases in which the procedure would seem to be unjustified. As an outstanding example is the established treatment of Furuncles, with a large percentage of successes. In his very excellent article published in the July, 1937, Archives of Physical Therapy, Dr. Disraeli Kobak, M.D., Chicago, Illinois, says "Proof that the therapeutic effect of short waves is not to be ascribed solely to heat and vasodilatation is supplied by the very satisfactory results observed in inflammatory and suppurative

processes and also from currents of low wattage but of very short wave-lengths, the heating effect of which virtually was absent. It is evident that the effectiveness of short wave therapy is due to a combination of factors, such as increase of hydrogen ion concentration, phagocytosis, resorption of the effete metabolic products and stimulation of reticulo-endothelial cells."

However, in conclusion, those clinicians who accept Short Wave Therapy for its true worth as a dependable adjunct, rather than as a system of complete treatment, will be highly gratified with the outcome. With this concept the prescriber will not anticipate the rehabilitation of an incurable arthritic, the miraculous resurrection of the congenital cripple, nor build hope for the hopeless.

Instead, the basic knowledge of anatomy, pathology, in fact, the Science of Medicine will influence reliance upon Radiathermy as the first source of treatment for those conditions amenable to such therapy, rather than regale so valuable a modality to the realm of last resort after all other means have failed.

"BASIC SHORT WAVE ENERGY"

The term Short Wave is employed to indicate an electrical energy of an alternating character, oscillating at tremendously rapid frequencies compared to those heretofore employed for conventional spark-gap diathermy. Because of this change in characteristics it has become possible to alter the methods for applying the energy to living tissue and, seemingly, the physiologic effects have been varied as well. In the conventional form of spark-gap diathermic therapy, electrical contacts are established on the bared skin by means of metallic electrodes and the tissue area between these electrodes becomes an actual electrical conductor of the energy. An electrical current of a frequency sufficiently rapid to elicit no sensory or muscular response (usually about 1,000,000 oscillations or 300 meter wave length) is then impressed upon the circuit thus created, and the tissue conductor becomes heated in direct proportion to the electrical resistance encountered therein. Skin, fat, muscle, blood, etc., all possessing varying resistance values, are heated accordingly with preponderant heating of the highly resistant skin and fat.

Through the use of very high frequency (Short Wave) currents, the energy application may now be made by means of non-contact electrodes and the electrical function which produces the subsequent heating is quite another factor. If the bare metal electrodes are separated from the skin by several layers of non-

conducting material, cloth, felt, etc., little or no effect results from the application of a conventional diathermy current. But, if these same electrodes, thus separated from the skin, are energized by a short wave current, distinct heating of the tissue prevails. In this case the heating is not due to direct resistance, but occurs because of the creation of an "electro-static" field between the electrodes, which under such circumstances serve as the plates of a simple condenser system.

A similar phenomenon is observed in the practice of auto-condensation with conventional diathermy, in which one metal plate, insulated from the patient's body (the auto-condensation pad), is connected to a terminal of the apparatus, and the patient, by means of an actual electrical contact (the auto-condensation

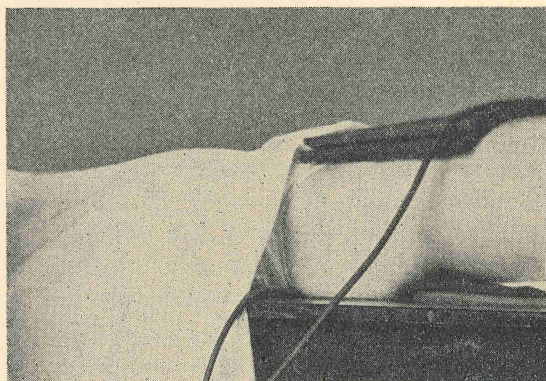


Fig. 1
CONDENSER PAD ELECTRODES
Note insulating spacing material between applicators and skin

handle), is connected to another terminal to complete the circuit. In this application the plate in the auto-condenser pad acts as one plate of the condenser system and the patient functions as the other plate, whereas in short wave applications with condenser type electrodes, two distinct plates are employed and the tissue to be treated is subjected only to the electrostatic field thus created. The procedure might be likened to the use of two auto-condensation pads with no direct electrical connection to the patient.

No evidence is available of the exact means by which tissue heat ensues in the electrostatic field, but it is logical to assume from an electrical standpoint that it is due to "dielectric" losses. If it may be conceived that a tissue cell comprises a minute con-

denser in itself, the plasma serving as a "plate" and the cell wall as a "dielectric," it may be said for the purpose of illustration that a tissue body subjected to the electrostatic field of short wave condenser electrodes becomes a conglomerate of tiny individual condensers each adjacent to another. Thus, when influenced by the electrostatic field, the entire composite becomes a series of condensers with electrical losses between them producing heating effects.

By extending this theory it is possible to employ another common electrical practice in the therapeutic consideration. A conductor wound in several turns and energized by alternating current, creates an "electromagnetic" field within the configuration. This factor has resulted in a similar device for therapy, in which

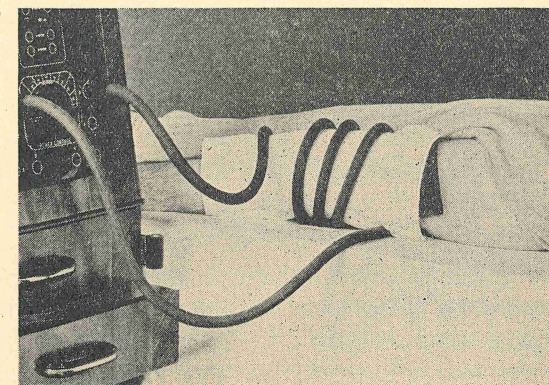


Fig. 2
INDUCTANCE CABLE LOOPS
Towel covers spacing material

the "induction cable" is employed to encircle the tissue to be treated.

Again no tangible evidence is yet produced to verify the heating mechanism, but from the electrical concept it is based on the phenomenon known as electrical "hysteresis," a condition prevailing in metallic contents of a magnetic field and resulting in heating effects.

However, it is sufficient for the Technician to know and ever remember, that the prime objective in Short Wave Therapy is simply the production of heat and on this premise the dosage administration will be maintained well within the limits of comfortable tolerance to the patient. No claims are made that any one method of application has distinct advantages over any other

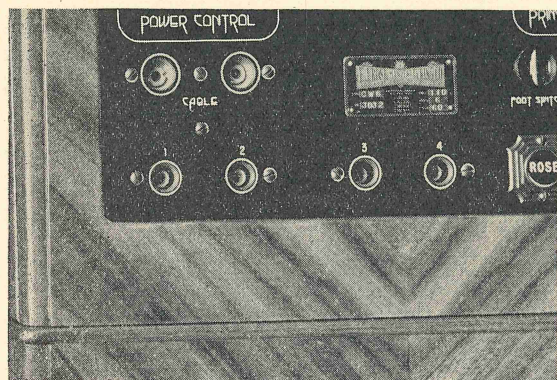


Fig. 3
MULTIPLE
TREATMENT
TERMINALS

method in any pathological condition, although a change in technic is frequently found to influence a more beneficial result, just as a change in other prescribed therapies often succeeds when obstinate tenacity fails.

PRINCIPLES OF PRACTICE

"TUNING"

The modern Radiathermy Unit comprises; (1) an "oscillator" or power section which is so arranged that the operator has little or no control over its function; and (2) a "patient circuit" consisting of the treatment electrodes with their connecting cords together with the tissue area under treatment embraced by the electrodes. To permit of dosage adjustment a control, usually a "variable condenser" is provided in the "patient circuit" by means of which it may be "tuned" or "de-tuned" in relation with the fixed power circuit. Though electrically inter-related, these independent circuits have no direct connection with each other and their association is similar to a radio transmitter situated closely adjacent to a tunable radio receiver. In the therapeutic instrument the fixed power circuit represents the broadcasting station and the tunable "patient circuit" portrays the receiver.

In explanation of the "tuning" procedure the simple process of "tuning" a radio receiving set may be employed for illustrative purposes. Assuming that the receiver is located very close to the transmitter, the reception from this hypothetical station covering almost any point on the receiver tuning dial, it would be found that at some certain position a tremendous blast of sound would ensue, but that "de-tuning" on **either side of this point** would

modulate the volume until it could be virtually silenced. Likewise in the Short Wave Unit, a certain position of the tuning device results in the greatest power output while deviation on either side of this position results in diminution of the energy as shown by the Meter customarily provided for the purpose. This condition of exact matching between the two circuits in the therapeutic consideration is known in the art as "peaking."

To continue the radio station analogy a "wave-trap" or "eliminator" might be installed in the aerial of the receiver to change the position of the point at which the greatest volume obtained in order to leave more of the dial free for other stations. Unknowingly, the Radiathermic technician produces a like condition by placing too much, or too little, insulating material, commonly termed "spacing," between the electrodes and the skin to the point that the maximum power output is extended completely beyond the range of the tuning device and, regardless of its manipulation, satisfactory power cannot be demonstrated. Obviously, the remedy for such a condition is, as the case may require, removal of or addition of a portion of the insulating material to return the basic patient circuit within the range of the tuning control.

Such a wide range of circumstances as are encountered in the treatment of the varying anatomic bulks as the hand, the chest, the ankle, the abdomen, etc., prohibits the inclusion of all treatments under identical conditions of the apparatus. Hence, recourse is often made to a method providing several terminals for attaching the electrodes, the combinations of which permit of a broad selection in the fundamental patient circuit to meet the changing requirement. Again, resorting to the radio illustration, this procedure is similar to the means provided on receivers for

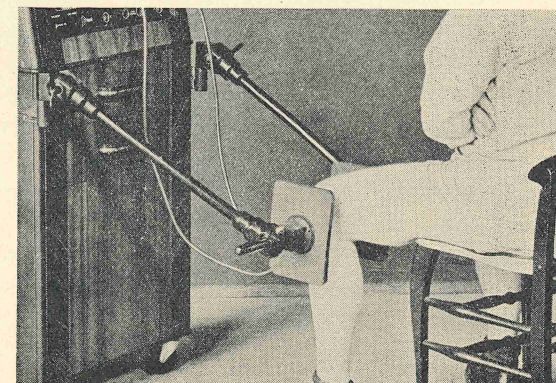


Fig. 4
AIR-SPACING
Actual air-space between
applicators and skin

quickly changing the length of the aerial for distant or local stations.

If the principle of tuning a Short Wave Unit has been mastered through the foregoing analysis, the actual technic of manipulating the instrument becomes relatively simple and the technician can take over almost any apparatus with full confidence.

"SPACING"

The use of insulating material, between the electrodes and the skin or, as the practice is termed in the vernacular, "spacing," is one of the prevailing problems in the technic of application because it presents the exact antithesis of conventional Diathermy procedure in which close skin contact is paramount. In the Radiathermic consideration "spacing" is a requisite and serves two distinct purposes, viz., (1) protection against energy accumulation with subsequent overheating on the skin, and (2) regulation of the depth of energy penetration. Regardless of the method of applying the energy, whether by the flat insulated condenser type electrodes, or by the coiled inductance cable electrodes, the "spacing" between the applicator and the skin definitely affects the ultimate result.

The customary condenser type Short Wave electrode comprises a flat metal plate encased in some insulating substance, usually rubber. Though a splendid insulator for an ordinary electric current, rubber does not prevent the electrostatic energy interchange, and if an electrode as described is placed in direct contact with the skin, the energy accumulation on the skin is immense. To dissipate this accumulation of superfluous energy, recourse is made to the "spacing" technic. However, almost any substance interposed also accumulates and conveys a certain amount of the electrostatic energy the least active being on actual air space. Therefore, a spacing substance which embodies the greatest air content with the least material mass is preferred. A number of common expedients which combine durability, sanitation and efficiency are terry cloth toweling, perforated felt pads, sponge rubber, etc. Of all, the toweling or perforated felt pads protected by washable covers seem to be most adaptable.

With Radiathermic Units of ample power and suitable wavelength actual "air-spacing" is possible. By means of mechanical holders on adjustable extension arms, the applicators may be adjusted to any position with air-space intervening between the electrode and the skin. This technic is especially desirable for

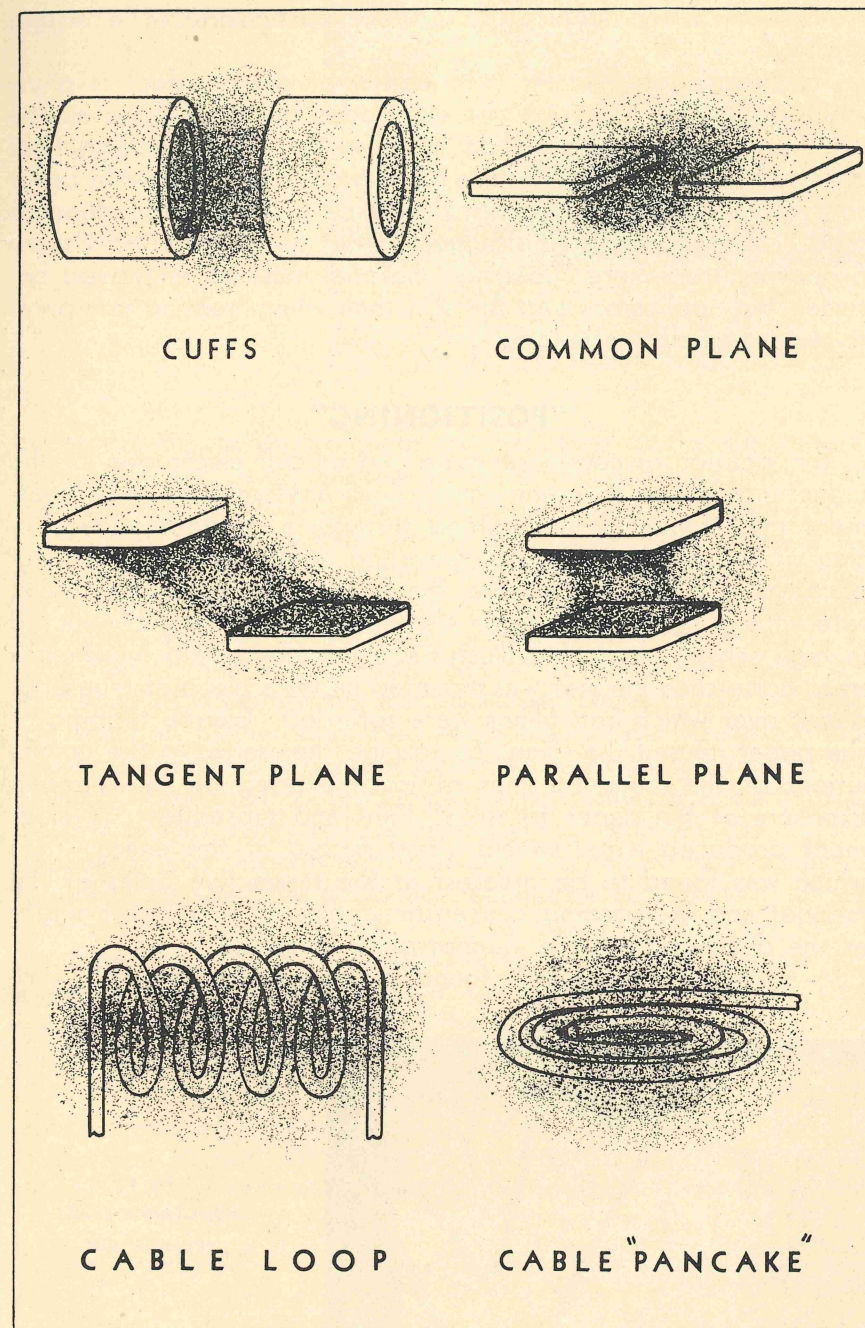


Fig. 5

Field density resulting from various electrode positions

treatment of the ambulatory patient particularly in a sitting position.

To again quote Kobak: "Production of depth effect is physically dependent (1) upon the electrodes being as large as the affected area and (2) spaced to an extent that the high field density near the electrodes lies outside the treated part in order to avoid surface heating and to produce a central homogeneous field." In other words to effectively treat deeply situated viscera proportionately more "spacing" material must be employed between the applicators and the skin than when treating comparatively superficial pathology.

"POSITIONING"

The location of condenser type pad or cuff electrodes, or the inductance cable, to reach any desired anatomic area for treatment may be better understood through a condensed description of the energy field concentration emanating from the applicators. To better visualize the action of this energy field, reference may be made to an elementary experiment conducted in high school physics to illustrate a magnetic field in which a small horse-shoe magnet was mounted under a piece of blue-print paper over which iron filings were sprinkled. Gentle tapping of the paper caused the filings to arrange themselves in the convolutions of the magnetic lines of force exerted by the magnet. Exposure of the paper to strong light and subsequent development produced a permanent visual record of the energy field which was found to be greatest at the respective poles of the magnet and in widening concentric circles of lessened intensity as the distance from the magnet poles increased.

A similar phenomenon is found in the electrostatic field pro-

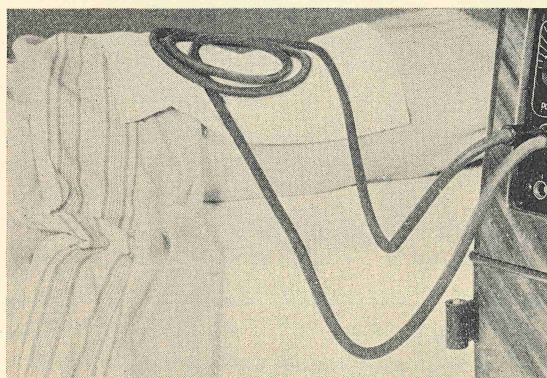
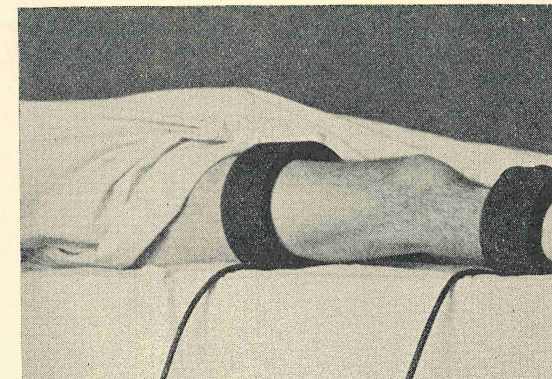


Fig. 6
INDUCTANCE CABLE
"Pancake" Coil

Fig. 7
CONDENSER CUFF
ELECTRODES
Note wide separation above
and below knee



duced by the condenser pads of the Short Wave therapeutic instrument, and as a consequence great latitude in placement of the pads is permitted. Unlike conventional Diathermy both electrodes may be placed even on the same plane, if so desired, for certain localization of treatment with splendid results. The schematic drawings in Figure 5, Page 8, illustrate the active field concentration effected by various positions of the applicators.

Further, localization of effect can be obtained by unbalancing the "spacing" between the electrodes and the skin, i. e., by spacing one pad further than the other, the greater heating effect being experienced under the electrode in closer proximity. For example, treatment to the lumbar region may be accomplished by interposing but one-half inch spacing between the lumbar applicator and the skin with one and one-half or two inches intervening between the abdominal applicator and the skin. Again referring to Figure 5, Page 8, it will be noted that a similar effect could be produced by two pads on the same plane, one over the lower dorsal area and the other low on the sacrum, or a "pancake" cable configuration over the lumbar area provides a third method.

Anatomic protuberances and curved anatomic contours offer a minor problem in the administration of Radiathermic Therapy. It has been shown that localization of heating effects can be accomplished by irregular "spacing" between the electrodes and the skin. Likewise, if an anatomic part, such as the nose or ear, protrudes beyond the normal anatomic plane it will be the recipient of a greater portion of energy with proportionate heating ensuing. The remedy for this condition is additional insulating material over the part involved and slight curving of the electrode to equalize the spacing. A light sand-bag weight or a

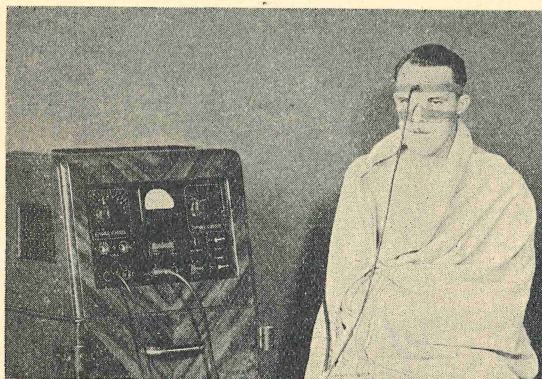


Fig. 8

SPECIAL SINUS APPLICATOR

Note retaining straps to maintain contour conformation

bandage may be employed to maintain the electrode curve.

Similarly in applications to any curving contour such as an extremity, the forehead, etc., the electrode should be fitted to the contour and held in place as above described. A flat electrode placed on the rounded surface of the arm or leg produces the geometric picture of an arc meeting a plane surface. Obviously, greater heating obtains at the point of closest approximation, and the applicator should be adjusted to procure equal spacing at all points.

ROUTINE PROCEDURE

Clothing should be removed from the field of treatment not only as a sanitary measure, but because of the professional aspect. Few patients relish an examination unless properly draped and the application of Short Wave Therapy deserves the same delicacy. In addition, accumulation of perspiration may result in skin damage since moistened material in the field is more efficient as

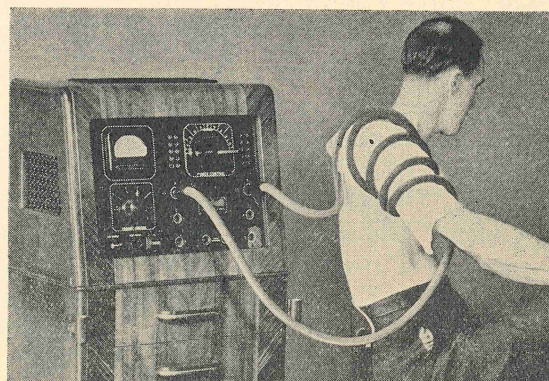


Fig. 9

INDUCTANCE CABLE ARM and SHOULDER

Towel covers spacing material

a condenser "plate" than dry skin and heat concentration in that area results. Incidentally, and for the same reason, spacing material of any nature should always be very dry.

In the same manner that moisture functions as a condenser "plate," metal in the treatment field reacts excessively to the energy. As a consequence all metal objects, and especially those which may contact the skin, such as brassiere clips, garter buckles, metal spectacle frames, pins, etc., must be removed from the treatment field. Metallic objects not in the immediately adjacent field are not affected.

Treatments should not be conducted on a metal table or a wooden table with imitation leather covering unless many thicknesses of blanket are used in the form of a mattress to intervene between the table top and the electrodes which may be placed thereon. Since the field about an electrode extends on both sides, an electrode lying directly on the table may energize the entire frame to the point that contact of the patient may result in a spark and tissue damage. Imitation leather material is treated with a substance heavily metallic, and a similar condition may ensue unless the blanket precaution is taken.

It is again emphasized that the sole patient reaction to therapeutic short wave energy should be that of pleasant and comfortable warmth. If undue heating or intensive aching of a member occurs during treatment it is ample evidence that the current volume is too great. Short wave energy conversion to heat seems to be cumulative. A treatment inaugurated with a current volume so mild that virtually no heating effect is experienced at the beginning will be found at the expiration of fifteen to twenty minutes to have developed a surprising temperature increase without having changed the current volume. Likewise, a massive dosage to create immediate heat sensation will soon develop intolerable temperature effects requiring prompt current reduction. Hence, all administrations of Short Wave Therapy should begin with mild current volume, even tending toward the ultra-conservative, and sufficient time should elapse to definitely determine the patient reaction before current increase is begun.

The duration of treatment is more or less flexible and no definite rule can be set forth. Treatments have been given ranging from ten minutes for sinus application to as much as eight hours, intermittently, for Hyperpyrexia (artificial fever). Application of thermal energies results, primarily, in the acceleration of circulatory functions. Empirically, it has become a practice to concede that maximum acceleration is established after approxi-

mately twenty minutes of Short Wave energy application. Additional time of treatment seems to effect no additional benefit in the ultimate result, so the above dosage has been established, clinically, as the ideal. However, in those conditions attended by extreme pain in which Radiathermy brings definite alleviation there is no contra-indication to extending the time, within reason, to prolong the relief. On the other hand, development of pain symptoms during Radiathermic applications is ample evidence of acute reaction and the treatment should be terminated forthwith. As stated heretofore, a change in the technic of application may alter the patient reaction entirely, and several of the suggested methods should be tried before eliminating the therapy in toto.

SUMMARY

To briefly summarize the technic of Radiathermy procedure, the following outline affords a useful sequence:

1. Prepare the patient, preferably with clothing removed from the area to be treated, and all metallic appurtenances removed from the energy field. Place the patient in the most comfortable position consistent with the particular condition under consideration.
2. After ample dry "spacing" material has been applied to intervene between the applicators and the tissue, place the electrodes selected in accordance with the suggestions herein contained.
3. Examine the Radiathermy Unit to see that all connections are in order and begin the treatment by "tuning" the apparatus to deliver a mild current volume as shown by the recording device provided on the Unit.
4. Permit several minutes to elapse to determine the patient's reaction to the energy administered. If no reaction develops the current volume may be adjusted to a greater volume until mild heat sensation is experienced. If proper "tuning" cannot be obtained the "spacing" material should be increased or reduced as the case may require, or, if a "multiple treatment terminal" Unit is employed, the electrode connections changed to suit.
5. To forestall the "martyr" to heat, or to obviate overheating in patients incapable of voluntary information, frequent inspection may be made by momentarily turning "off" the apparatus and laying the hand on the skin under the applicator.

TREATMENT TECHNICS

The following recommendations offer a selection of methods for Radiathermic applications under varying conditions. Again it is emphasized that no particular technic is offered as being superior to another and the choice remains with the Technician to suit the greatest convenience for the immediate case at hand. It is often advisable to employ a variation in the treatment program, if the initial administrations fail to produce the desired response.

It is assumed, without question, that the requisite insulating material, actual air-space, towels, felt, etc., will be used invariably to create "spacing" between the electrodes, regardless of type, and the skin.

THE EXTREMITIES

METATARSUS

Patient Seated

Electrostatic:

Place two 6"x8" Condenser Pad Electrodes on the floor on the same plane (Fig. 5, Page 8) separated about three inches from one another. If the floor is concrete or painted, place some insulating material, books, plain wooden board, etc., between the electrodes and the floor. Rest the ball of the foot and the heel upon the respective inner edges of the electrodes with the space between directly under the area to be treated.

Air-spacing can be employed, if available, by elevating the foot on a chair and adjusting the electrodes to lateral positions, one each side of the foot. (Fig. 4, Page 6.)

Electromagnetic:

Inductance Cable "pancake" Coil (Fig. 6, Page 9) tightly coiled with the central convolutions under the area to be treated.

Patient Reclining

Electrostatic:

4"x6" Condenser Pad electrodes over the toes and under the heel, respectively, in a tangent plane (Fig. 5, Page 8) held in place by encircling bandages. The electrodes may extend beyond the foot to effect a space between the inner edges. Air-spacing, if available, may be employed with lateral placement of the electrodes.

Electromagnetic:

Induction Cable loops encircling entire foot. (Fig. 2, Page 4.)

METATARSUS (Both Feet Simultaneously)

Patient Seated

Electrostatic:

9"x11" Condenser Pad Electrodes on the floor separated about one foot apart. If the floor is concrete or painted, insulate the electrodes therefrom with books, a wooden board, etc. Place the ball of each foot upon the edge of each electrode, respectively, the heels being free from contact with any part thereof.

Electromagnetic:

Induction Cable "pancake" coil (Fig. 6, Page 9) loosely coiled with

central convolutions under the area to be treated. The feet must be separated from one another by about an inch of space. Spacing material placed between the feet will obviate accidental physical contact resulting in an unpleasant, although not at all dangerous sparking which may occur if the feet touch.

Patient Reclining

Electrostatic:

4"x6" Condenser Pad electrodes under the ball of each foot, respectively, held in position by encircling bandages. The feet and legs must be spaced apart and insulating material placed between the feet will obviate accidental physical contact.

Electromagnetic:

Induction Cable loops encircling both feet, simultaneously, after insulating material has been placed between the feet to prevent physical contact with one another.

ANKLE

Patient Seated

Electrostatic:

9"x11" Condenser Pad electrode on the floor, insulated therefrom with a book or wooden board, if concrete or painted, the entire foot resting wholly on the electrode. A 9"x11" Condenser Pad electrode placed on the knee, or a Condenser Cuff electrode (Fig. 7, Page 10) affixed to the calf of the leg.

Air-spacing may be employed by elevating the ankle on a chair and adjusting the electrodes laterally, i. e., one on each side of the ankle.

Electromagnetic:

Induction Cable loops encircling ankle. (Fig. 2, Page 4.)

Patient Reclining

Electrostatic:

6"x8" Condenser Pad electrode affixed to sole of foot by means of encircling bandage. Condenser Cuff electrode encircling calf of leg. Air-spacing may be employed by adjusting the electrodes laterally, i. e., one on each side of the ankle. (Fig. 4, Page 6.)

Electromagnetic:

Induction Cable loops encircling ankle. (Fig. 2, Page 4.)

ANKLE (Both Extremities Simultaneously)

Patient Seated

Electrostatic:

Two 9"x11" Condenser Pad electrodes placed on the floor, and insulated therefrom with books or a wooden board, if concrete or painted, spaced about one foot apart. Each foot, respectively, rests wholly on each of the electrodes. Alternate: Both feet resting wholly on one 9"x11" Condenser Pad Electrode placed on the floor; another 9"x11" Condenser Pad Electrode resting on both knees.

Electromagnetic:

After placing insulating material between the feet to prevent physical contact with each other, encircle both ankles simultaneously with Induction Cable loops.

Patient Reclining

Electrostatic:

6"x8" Condenser Pad electrodes to wholly cover the sole of each foot, respectively, affixed by encircling bandages. The feet must not be permitted to make physical contact and insulating material placed between them will be of aid in accomplishing this end.

Electromagnetic:

Same as for patient seated.

KNEE

Patient Seated

Electrostatic:

Condenser cuff electrode encircling calf of leg and another encircling middle of thigh. Preferably the foot should be elevated to maintain the limb in an extended position to obviate over heating in the popliteal space. Alternate: 6"x8" condenser pad electrodes placed laterally one each side of the knee and held in place by encircling bandage. If available, air-spacing may be employed (Fig. 4, Page 6).

Electromagnetic:

Induction cable loop encircling the knee (Fig. 2, Page 4).

Patient Reclining

Electrostatic:

Same as for patient seated (Fig. 7, Page 10).

Electromagnetic:

Same as for patient seated (Fig. 2, Page 4).

KNEE (Both Extremities Simultaneously)

Patient Seated

Electrostatic:

Condenser cuff electrode encircling each calf, respectively. Prevent physical contact between the feet or knees by insulating material interspaced between.

Electromagnetic:

Impractical.

Patient Reclining

Electrostatic:

Same as for patient seated.

Electromagnetic:

Impractical.

HIP

Patient Seated

Electrostatic:

9"x11" condenser pad electrodes over lower lumbar area. Condenser cuff electrodes encircling thigh.

Electromagnetic:

Impractical.

Patient Reclining

Electrostatic:

9"x11" condenser pad electrodes placed anterior and posterior on a parallel plane (Fig. 5, Page 8; Fig. 1, Page 3). Alternate: Same as patient seated.

Electromagnetic:

Inductance cable "pancake" coil with central convolutions covering area to be treated (Fig. 6, Page 9). Alternate: Inductance cable loops encircling area.

HIPS (Both Members Simultaneously)**Patient Seated****Electrostatic:**

9"x11" condenser pad electrodes placed laterally one each side of the pelvis. Maintain curvature conformation with encircling bandage. If available, air-spacing may be employed with lateral placement of the electrodes (Fig. 4, Page 6).

Electromagnetic:

Impractical.

Patient Reclining**Electrostatic:**

Same as for patient seated.

Electromagnetic:

Impractical.

LEG

Any portion of the lower extremity may be treated by encircling condenser cuff electrodes above and below the area, or by a 9"x11" condenser pad electrode placed on the sacrum and encircling condenser cuff below the region. For example, a 9"x11" condenser pad electrode on the sacrum and a condenser cuff electrode encircling the calf will treat the proximal two-thirds of the member. Similarly, inductance cable loops encircling the portion may be employed.

PHALANGES**Electrostatic:**

6"x8" condenser pad electrodes placed on a table on the same plane (Fig. 5, Page 8), separated about three inches. Palm of the hand resting on one electrode and tip of the fingers resting on the inner edge of the other.

Electromagnetic:

Inductance "pancake" coil with central convolutions covering area to be treated.

PHALANGES (Both Hands Simultaneously)**Electrostatic:**

6"x8" condenser pad electrodes separated about six inches on the same plane (Fig. 5, Page 8). Tips of the fingers of each hand resting on each pad, respectively. The thumbs must be prevented from making physical contact.

Electromagnetic:

Induction "pancake" coil (Fig. 6, Page 9) with fingers over central convolutions. Physical contact of the fingers must be prevented.

WRIST**Electrostatic:**

6"x8" condenser pad electrodes covering palm of hand. Condenser cuff electrode encircling forearm. Alternate: 6"x8" condenser pad electrode under palm of hand; another under the forearm. Electrodes on the same plane (Fig. 5, Page 8).

Electromagnetic:

Inductance cable loop encircling the wrist (Fig. 2, Page 4).

WRIST (Both Members Simultaneously)**Electrostatic:**

6"x8" Condenser pad electrodes covering palm of each hand respectively.

Electromagnetic:

Impractical.

ELBOW**Electrostatic:**

Condenser cuff electrodes encircling forearm, another encircling biceps. Alternate: Patient seated in a low chair beside a desk or table of desk height. 6"x8" condenser pads on the same plane (Fig. 5, Page 8), separated about six inches. One under forearm and the other under the inner surface of the arm with the elbow in the space between.

Electromagnetic:

Condenser cable loops encircling the elbow.

ELBOWS (Both Members Simultaneously)**Electrostatic:**

Condenser cuff electrodes encircling each forearm respectively. The hands must be prevented from making physical contact.

Electromagnetic:

Impractical.

SHOULDER**Electrostatic:**

Condenser cuff electrodes encircling the biceps. 9"x11" condenser pad electrodes covering the scapula. If air-spacing is available, anterior, posterior placement of the electrodes may be employed. (Fig. 10, Page 19.)

Electromagnetic:

Inductance Cable "pancake" coil with central convolutions covering the condyle of the humerus. Or inductance cable loops encircling the member. (Fig. 9, Page 11.)

SHOULDERS (Both Members Simultaneously)**Electrostatic:**

6"x8" condenser pad electrodes placed laterally over the deltoid on each shoulder, respectively, with the curvature conformation main-

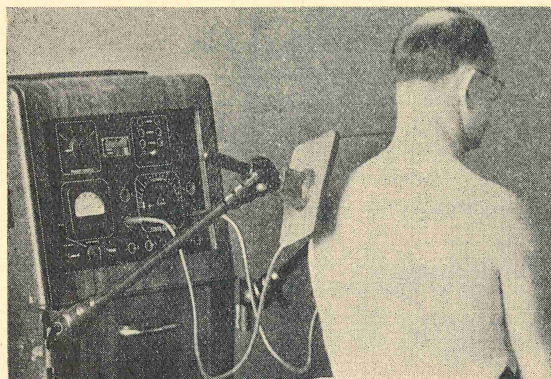


Fig. 10
Air-spaced application to
one shoulder

tained by a bandage encircling the entire torso. If air-spacing is available similar position of the electrode may be employed. (Fig. 11, Page 20.)

Electromagnetic:
Impractical.

ARM

Any portion of the upper extremity may be treated by placing a condenser pad electrode on the scapula with an encircling cuff below the region. For example, a condenser pad on the scapula with a condenser cuff encircling the forearm will treat the proximal two-thirds of the member. Similarly, inductance cable loops encircling the region may be employed. (Fig. 3, Page 9.)

THE TORSO

ABDOMEN

Electrostatic:

Condenser pad electrodes slightly larger than the organ to be treated applied posterior-anterior or laterally in a parallel plane (Fig. 5, Page 8). For deeply situated viscera the electrodes should be amply spaced (Page 7). By unequal spacing the energy field can be concentrated posterior or anterior as desired (Pages 7, 9).

Electromagnetic:

Inductance Cable pancake coil with central convolutions covering area to be treated. (Fig. 6, Page 9.)

THORAX

Electrostatic:

Condenser pad electrodes applied posterior-anterior or laterally in a parallel plane. (Fig. 5, Page 8) Lateral applications should employ an encircling bandage to maintain contour conformation.

Electromagnetic:

Inductance Cable "pancake" coil with central convolutions covering area to be treated.

VERTEBRA

Electrostatic:

6"x8" Condenser pad electrodes on the same plane (Fig. 5, Page 8), separated 6" or 8", the area to be treated occupying the space between the electrodes. Alternate. 3½"x24" cuff electrode covering the entire spine; 9"x11" condenser pad electrode diagrammatically opposite on a parallel plane. (Fig. 5, Page 8.)

Electromagnetic:

Inductance Cable "pancake" coil in elongated convolutions covering the area to be treated.

THE HEAD

EAR

Patient Seated

Electrostatic:

6"x8" condenser pad electrode, well spaced, covering affected ear retained by encircling bandage; 6"x8" condenser electrode under opposite arm on tangent plane (Fig. 5, Page 8). If air-spacing is available, one electrode in closer proximity to the affected ear, the other, widely spaced.

Electromagnetic:

Induction Cable "pancake" coil with central convolutions over the ear.

Patient Reclining

Electrostatic:

Place patient comfortably resting on the side. Treat as outlined for "patient seated."

Electromagnetic:

Inductance Cable "pancake" coils with central convolutions covering area to be treated.

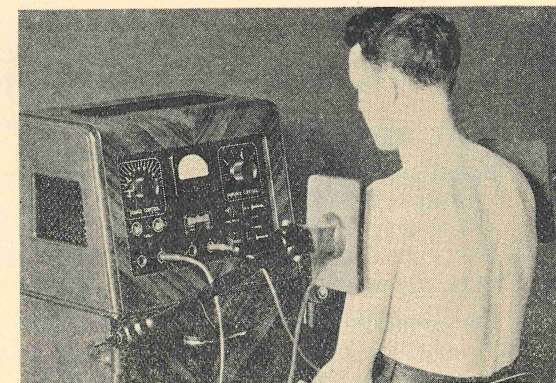


Fig. 11
Air-spaced application to both
shoulders simultaneously

EARS (Both Members Simultaneously)**Electrostatic:**

Treat as for a single ear but equalize the spacing.

Electromagnetic:

Impractical.

SINUS**Electrostatic:**

Special sinus condenser pad electrode (Fig. 8, Page 11) applied to frontal and maxillary sinus; 9"x11" condenser pad electrode posterior between the shoulders. Alternate: 6"x8" condenser pad electrode retained by encircling bandage to cover forehead; 6"x8" condenser pad electrode posterior upper dorsal region.

Electromagnetic:

Impractical.

THROAT**Electrostatic:**

4"x6" condenser pad electrodes diagrammatically opposite on parallel plane (Fig. 5, Page 8), placed posterior, anterior or laterally to embrace area to be treated; retain by encircling bandage. Alternate: Special sinus pad electrode, position reversed with maxillary legs on each side of throat and wide forehead band covering larynx; 6"x8" condenser pad electrode over lower cervical region.

Electromagnetic:

Inductance cable loop encircling the throat.

EYES**Electrostatic:**

Special bifurcated condenser pad electrodes covering the eyes; 6"x8" condenser pad electrode covering the lower cervical region. Alternate. The application outlined for sinus with two 6"x8" condenser pad electrodes is also effective for eye applications.

Electromagnetic:

Impractical.

SPECIAL APPLICATIONS**PERINEAL REGION****Electrostatic:**

Patient seated or reclining with legs separated. 9"x11" Condenser Pad electrodes one under each thigh, respectively. Alternate: One 9"x11" Condenser Pad electrode posterior on thigh; another anterior on opposite thigh.

Electromagnetic:

Induction cable "pancake" coil with central convolutions covering area to be treated.

PROSTATE**Electrostatic:**

Special prostatic orificial electrode inserted through rectum to cover organ; 9"x11" Condenser Pad electrode over the abdomen. Alternate: Patient in conventional knee chest position as for prostatic massage. Place a 9"x11" Condenser Pad electrode under the patient's abdomen. Place another 9"x11" Condenser Pad electrode on the floor, upon which the physician stands with both feet wholly contacting the electrode. The cotted finger is inserted rectally and massage conducted simultaneously with the current application, which takes place through the operator's finger. Current volume can be adjusted during the application as both the operator and the patient experience identically the same heat sensation.

VAGINAL

Special vaginal orificial electrode inserted; 9"x11" condenser pad electrode covering the abdomen. Following local application general abdominal application should be practiced, embracing the uterine area between condenser pad electrodes applied posterior-anterior.

INDIRECT APPLICATIONS**Electrostatic:**

Energy may be applied to the eyes, ears, nose, etc., by placing the patient either seated or reclining on a 9"x11" condenser pad electrode and with another condenser pad electrode about one foot from operator's body. This electrode may be placed on a table or other convenient stand. With the operator's finger contacting the part to be treated the current volume can be adjusted to produce the heating sensation which is sensed by both the operator and the patient in equal intensity.

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HYPERPYREXIA

The practice of Hyperpyrexia, or artificial fever, is distinctly an institutional procedure. The very character of the therapy requires constant attention to the patient, in addition to facilities for immediate emergency measures in those cases which may develop a radical reaction to the treatment. The success of a Hyperpyrexia application, in reaching the desired objective temperature, is dependent entirely upon the thoroughness with which the body is insulated to confine heat radiation emanating therefrom. Unless adequate insulation is provided the normal cooling mechanism of the body defeats the purpose. In the Short Wave method, the patient is customarily wrapped, nude, in a dry muslin sheet followed by a rubber sheeting covering, which in turn is followed by woolen blankets. The wrapping openings should be at the patient's back to provide access for rectal temperature recordings every fifteen minutes without unduly exposing and cooling the body. Ingestion of 1/10% sodium chloride solution, preferably warmed, replaces chloride losses experienced through perspiration and frequently forestalls reaction. Two 9"x11" condenser pad electrodes, or two special 12"x18" hyperpyrexia condenser pad electrodes are employed. These may be placed one covering the sacrum and the other covering the upper dorsal area on the same plane (Fig. 5, Page 8), or as an alternate one covering the upper dorsal posterior and the other covering the thighs anterior. Energy is then applied continuously until a temperature within 5/10ths of a degree of the desired objective is reached, at which point the apparatus is turned off. The temperature is prone to continue rising for another 1/2 degree and usually remains at that point for some time, then begins to lower, at which stage current is again applied and by intermittent applications the level can be maintained almost indefinitely. Some clinicians employ sodium amytal to maintain virtual coma during the entire seance. Due to the precision of the treatment, it is highly recommended that the Physician in charge refer to the several splendid articles on the subject, which have appeared in recent professional journals:

Archives of Physical Therapy, September, 1937—

"Short Waves as Pyretogenic Agent"—Halphem and Auclair.

Journal of A. M. A., March 16, 1935—

Desjardins, Epstein, and others.

ELECTRO SURGERY

TISSUE-CUTTING

Separation of living tissue by high frequency currents is effected by a minute spark which precedes the cutting instrument. Thus, two factors affect the procedure, (1) current volume and (2) the speed with which the instrument is drawn across or through the tissue. Although proclaimed as "bloodless surgery" the method is effective only in the control of capillary "oozing" and when larger vessels are encountered characteristic spurting results as with the ordinary scalpel.

The amount of the searing at the edge of the wound governs the healing period required. Extensive searing results in slow healing and profuse drainage. Consequently, this factor should be controlled to the point that it is barely sufficient to eliminate the capillary oozing.

As heretofore stated, the extent of the searing is a product of both current volume and the speed with which the incision is made. A slow cut with comparatively large current volume produces an undesirable searing effect which is rectified by either (1) a more rapid cut with the same volume of current or (2) the same speed of incision with a reduced current volume. Of course, the current volume must be sufficient to procure smooth cutting without tissue "drag."

Inasmuch as the cutting procedure depends upon the minute spark from the instrument, the cutting electrode should meet the tissue at a right angle. Long routine tends to influence a tangent plane similar to the use of the ordinary scalpel, but much better results are obtained if the instrument is handled in the manner of a pen or pencil. Pressure is not required with electro surgery, as the cutting device incises the skin cleanly and can be carried to any desired depth by simply drawing it gently across the flesh. Contact on the foot switch to energize the instrument must always be made before the cutting electrode is brought into contact with the tissue to be incised, otherwise, an area of undesirable tissue destruction is created before the cutting effect is produced.

Ligation of major vessels involved in the area with a ligature material is a requisite before electro surgery is conducted. Minor vessels can be controlled either by (1) intermittently contacting the bleeding point with the cutting electrode to produce a sparking effect or (2) grasping the point with a Hemostat, which in turn is touched with the cutting electrode, the current being conducted through the metallic instrument to coagulate the tissue engaged between the teeth of the forceps. Controlled in this manner no additional ligation is necessary.

Incision is customarily conducted by means of an electrode in the form of a flattened knife blade electrode or a needle electrode. Extirpation is accomplished by means of a thin wire loop electrode. For example, in the extirpation of a neavus or superficial malignancy, the pathology or growth may be removed by means of a series of sections procured by numerous "scooping" cuts with a loop. Pedunculated papillomas may be incised at the base of the pedicle followed by extensive coagulation of the stump through intermittent contacts of the instrument to procure a sparking effect. In brief, the surgeon's routine approach is unchanged in electro surgery, the

only difference being substitution of the tissue cutting electrodes for actual scalpels or other surgical cutting instruments; the use of a coagulation current through the hemostatic forcep in place of actual ligation; and a "painting" movement of a ball electrode over an extensive area in place of actual hot wire cautery. Obviously, the exponent of electro surgery must of necessity be possessed of basic surgical training before attempting the procedure.

The technic of operation consists of (1) placing a 9"x11" condenser pad electrode on any convenient portion of the patient's body, which serves only to complete the field circuit; and (2) selection and use of a suitable electrode for the purpose at hand. The dispersive or "indifferent" electrode may be placed under the shoulders or the buttocks of the reclining patient, or it may be used as a cushion for the seated patient. Anaesthesia is a requisite in this procedure. Local blocking is suitable for minor surgery but general anaesthesia is necessary for extensive surgery. The method should not be used in connection with highly explosive anaesthetic gases, such as ethylene and similar derivatives. It may be safely employed in ether anaesthesia if meticulous care is used in removing open or partially emptied ether containers from the surgery and if a wet towel is used to surround the face mask.

COAGULATION

Coagulation in electro surgery indicates destruction of living tissue through actual coagulation of the cell lymph by lethal temperature generated within the area in the conversion of the high frequency energy. The method leaves a minor scarring defeat and offers distinct advantage over actual hot-wire cautery. Tissue destruction by contact with a heated element is a result of carbonization followed by eschar. The cicatrix subsequent to the method is usually harsh and rigid. Obviously interference with normal function has been known to follow the procedure, for example in the cervix. On the other hand the cicatrix following electro coagulation is soft and pliable.

Extensive areas, as in superficial neo plasms, may be coagulated by the use of a ball point electrode which is kept in constant motion, as well as contact, in "painting" strokes. The method is quite effective in cervical erosions and similar pathology involving mucosa, as well as in lesions in the epithelial structure.

Local applications in restricted areas, such as the tonsils, cervical canal, etc., may be conducted by the use of special electrodes in which two exposed metallic conducting elements are incorporated. This means of application is provided to confine the activity of the energy between the elements of the electrode only and prevent coagulation of contiguous tissue not pathologically involved. Inasmuch as specific instructions covering the detailed technic of such procedures accompany each instrument of the kind, repetition thereof is omitted in this brochure.

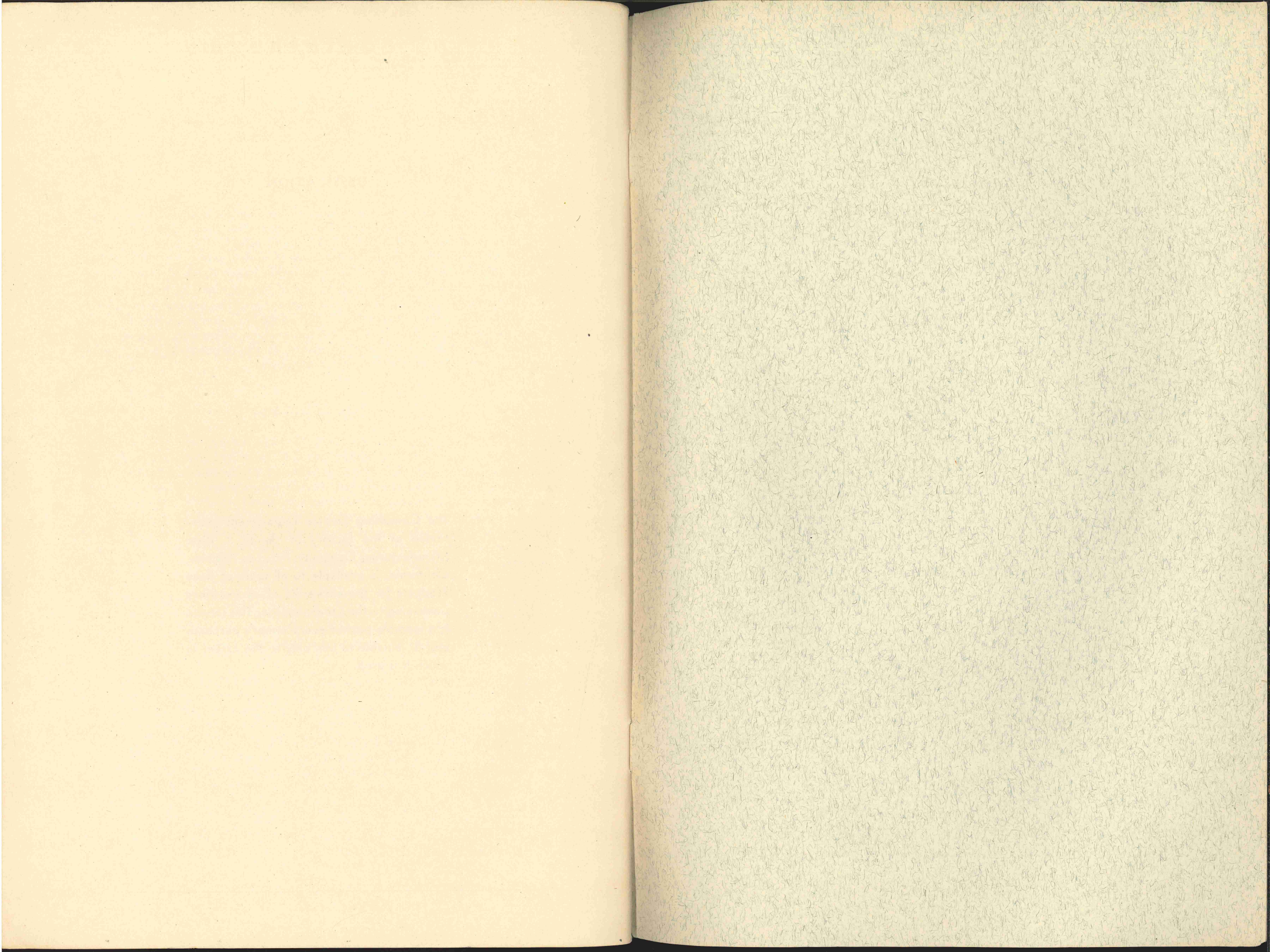
When employing an electrode incorporating a single active element, such as the ball point electrode, it is necessary to employ a 9"x11" condenser pad electrode placed at some convenient point on the patient's body, as heretofore described. When employing the double element type of

electrodes, the dispersive pad is not employed. Anaesthesia in the form of local block in epithelial structures or topical applications on mucosa is advisable.

DESSICATION

Dessication indicates dehydration of tissue and is less severe than coagulation. The principal of its application confines the tissue destruction to a very superficial layer and it has limited depth effect. This work renders the method exceptionally suitable for removal of moles, warts, etc. The technic is extremely simple involving the use of a rather heavy single element pointed needle electrode which is attached to one of the terminals of the instrument. No other connection is made to the instrument and the patient is completely free from any contact therewith. Light "dabbing" contacts with the electrode to the naevus produces a fine spark which effectively dessicates the blemish. Anaesthesia is seldom necessary as the procedure is not unduly painful if very light current volume is employed.

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